

Hazard Elimination Project Evaluation

Project Log # 200502093

Hazard Elimination Project W-3404

**Evaluation of the Intersection Relocation, Center Turn Lane Construction, and
Superelevation Revisions on NC 41 at the Intersection of SR 1945 (Jack Dale Road)
Duplin County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

Carrie L. Simpson, EI

Traffic Safety Project Engineer

1/31/2006

Date

Hazard Elimination Project Evaluation Documentation

Subject Location

Evaluation of Hazard Elimination Project W-3404 –
On NC 41 in the vicinity of SR 1945 (Jack Dale Road), Duplin County

Introduction

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis has been completed to measure the effectiveness of this hazard elimination project. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

Project Information and Background from the Project File Folder

The safety countermeasures chosen for the subject location were to:

- 1) Widen NC 41 for approximately 800 feet to provide a center left turn lane at the intersection with SR 1945 (Jack Dale Road),
- 2) Relocate the intersection of NC 41 and SR 1945 (Jack Dale Road) approximately 350 feet west, and
- 3) Revise the superelevation of a curve located at the intersection.

The subject location is situated in a rural area with no commercial development near the intersection. The posted speed limit on NC 41 is 55 mph within the vicinity of the intersection. Prior to the improvements NC 41 was a 20-foot roadway with 10-foot grass shoulders. SR 1945 intersected NC 41 in an area of sharp curvature before it was realigned to the west. The approach site distance on the east approach was limited due to the roadway curvature and the location of a house in the northeast quadrant of the intersection.

The initial crash analysis for this location was completed from November 1, 1994 through October 31, 1997 with a total of 40 reported crashes. The initial crash analysis included all crashes on NC 41 that occurred from 0.20 miles east of I-40 to 0.80 miles east of SR 1945 (Jack Dale Road). According to the initial crash analysis, there were 23 Ran Off Road crashes, 5 Rear End crashes, 1 Overturn crash, 5 Animal crashes, 1 Left Turn crash, 1 Right Turn Crash, 1 Head On Crash, and 3 Sideswipe Crashes. These crashes resulted in 1 class-A injury crash, 10 class-B injury crashes, and 14 class-C injury crashes.

The *Project Report* in the Project File Folder sites that most of the accidents in the initial crash analysis could be attributed to either lack of left turn storage or loss of control in the superelevated portion of NC 41. Two crash patterns were initially identified and examined, Rear End crashes and

Ran Off Road crashes. It was felt that the Rear End crashes were attributed to the lack of left turn storage at the intersection. A left turn lane was constructed to reduce this crash type. It was felt that Ran Off Road crashes were caused by either 1) motorists making a sudden maneuver to avoid vehicles stopped in the travel lane waiting to make a left turn onto SR 1945 or 2) motorists losing control in the superelevated curve. The left turn lane construction and the wedging of the curve were completed to alleviate this crash type. The project was completed on August 10, 2001 at an estimated cost of \$332,500.

Naïve Before and After Analysis

After reviewing the hazard elimination project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from April 1, 2001 through November 30, 2001. The before period consisted of reported crashes from September 1, 1997 through March 31, 2001 (3 Years, 7 Months) and the after period consisted of reported crashes from December 1, 2001 through June 30, 2005 (3 Years, 7 Months). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

In order to include the entire limits of the project, the treatment data consisted of all crashes on NC 41 within approximately 400 feet west and 850 feet east of the new intersection with SR 1945 (Jack Dale Road). In addition, an 800 feet Y-line was used on SR 1945 (Jack Dale Road) to include any crashes possibly effected by the realignment. Please see the attached *Location Map* for further detail.

The following table depicts the Naïve Before and After Analysis for the Total Crashes and Target Crashes at the treatment location. Please note that the Target Crashes for the applied countermeasure were:

- Rear End crashes AND
- Lane Departure crashes, which include Head On, Ran Off Road, and Sideswipe, Opposite Direction crashes

Treatment Information

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	13	4	-69.2%
Total Severity Index	21.34	2.85	-86.6%
Target Crashes	8	2	-75.0%
Target Severity Index	31.28	4.70	-85.0%
Volume	6100	8200	34.4%

Target Crash Information

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Fatal Injury Crashes	2	0	-100.0%
Non-Fatal Injury Crashes	3	1	-66.7%
Total Injury Crashes	5	1	-80.0%
Night Crashes	2	1	-50.0%
Wet Crashes	2	2	0.0%

The naïve before and after analysis at the treatment location resulted in a 69.2 percent decrease in Total Crashes, a 75.0 percent decrease in Target Crashes, and a 34.4 percent increase in Average Daily Traffic (ADT). Further investigation shows there was an 86.6 percent decrease in the Severity Index for Total Crashes and an 85.0 percent decrease in the Severity Index for Target Crashes. The before period ADT year was 1999 and the after period ADT year was 2003.

Results and Discussion

The naïve before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 69.2 percent decrease in Total Crashes and a 75.0 percent decrease in Target Crashes. Further investigation shows that the Severity Index of Total Crashes and Target Crashes appear to have decreased by 86.6 percent and 85.0 percent, respectively. The summary results above demonstrate that the Treatment Location appears to have had a substantial decrease in both the Total and Target Crashes and the Severity Index from the before to the after period using naïve methodologies.

A breakdown of the Target crashes in the before and the after period reveals the following results. In the before period there were seven lane departure crashes that occurred in the curve at the treatment location. Five of the seven were Ran Off Road crashes involving only the vehicle at fault. The remaining two lane departure crashes resulted in fatal Sideswipe, Opposite Direction crashes. One Rear End crash occurred on NC 41 in the before period. In the after period there were only two Target crashes, one Ran Off Road crash and one Rear End crash on NC 41. It appears that the revised curve superelevation, along with the other countermeasures, has alleviated the Ran Off Road crash problem.

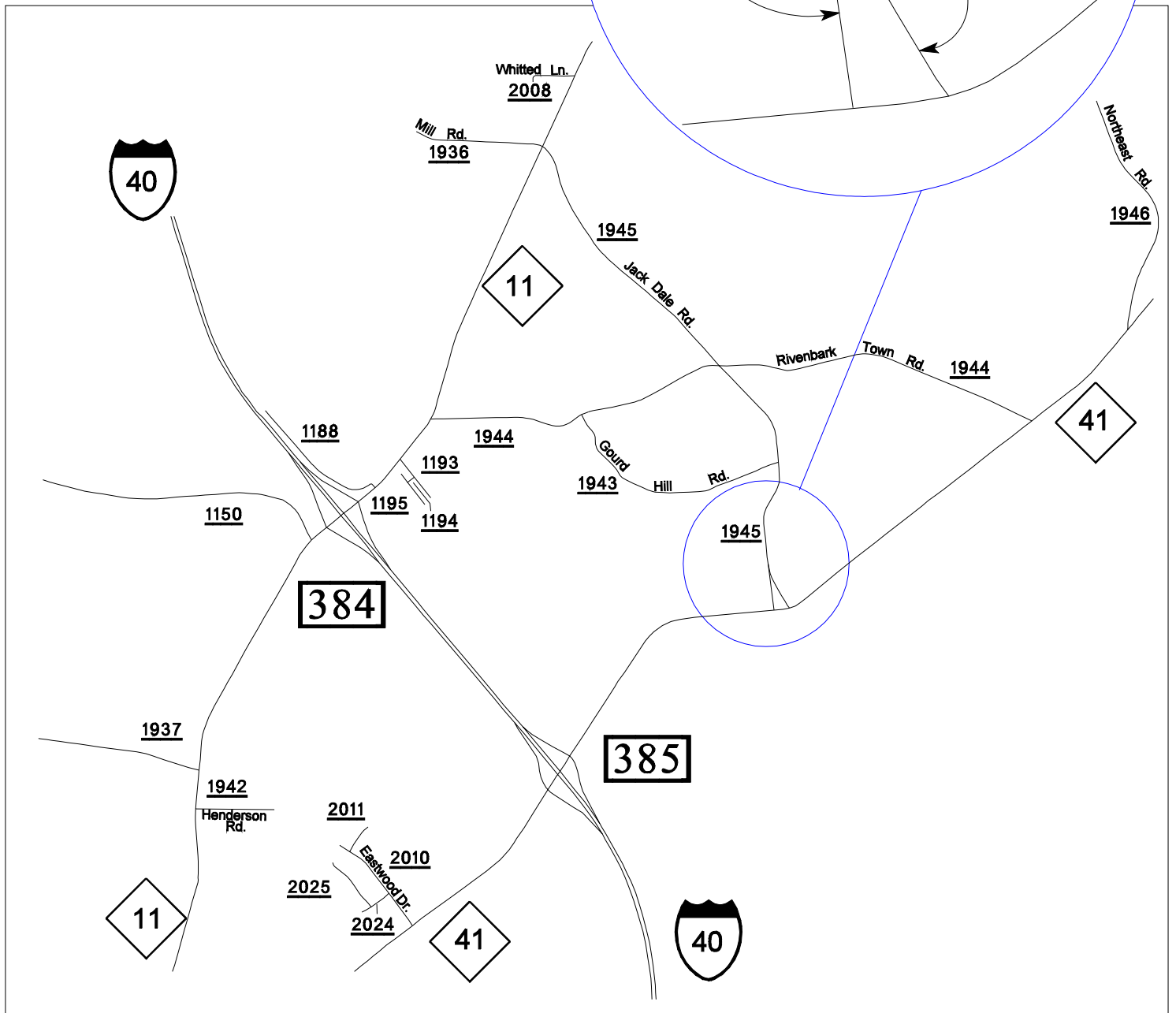
Please see the attached Treatment Site Photos. Photos are provided for all approaches of the Treatment Location. As shown in the photos, Curve Warning Signs with 45-mph advisory plaques are placed in advance of the curve in both directions of NC 41. The photos also show the improved sight distance from the new intersection with SR 1945 (Jack Dale Road).

As the Safety Evaluation Group completes additional reviews for this type of countermeasure, we will be able to provide more objective and definite information regarding actual crash reduction factors.

Location Map Hazard Elimination Project W3404 Duplin County

Treatment Location:

NC 41 at SR 1945 (Jack Dale Rd)



Treatment Site Photos (Taken on December 6, 2005)



Driving south on SR 1945 (Jack Dale Road) towards the Treatment Location.
The old alignment was located to the left.
Also notice the Intersection Warning Sign above.



Looking south on SR 1945 (Jack Dale Road) at the intersection with NC 41.

Treatment Site Photos (Taken on December 6, 2005)



Driving west on NC 41 towards the Treatment Location.
Notice the Curve Warning Sign with the attached 45 mph advisory plaque.



Driving west on NC 41 through the superelevated curve.
Notice the Intersection Warning Sign and the chevrons lining the curve.

Treatment Site Photos (Taken on December 6, 2005)



Driving west on NC 41 towards the intersection with SR 1945 (Jack Dale Road).



Driving east on NC 41 towards the intersection with SR 1945 (Jack Dale Road).
Notice the Curve Warning Sign with the attached 45 mph advisory plaque.

Treatment Site Photos (Taken on December 6, 2005)



Driving east on NC 41 at the intersection with SR 1945 (Jack Dale Road).



Driving east on NC 41 towards the superelevated curve and the old intersection with SR 1945 (Jack Dale Road).

Treatment Site Photos (Taken on December 6, 2005)



Looking east at the sight distance from the old SR 1945 (Jack Dale Road) alignment.



Looking east at the improved sight distance from the new SR 1945 (Jack Dale Road) alignment.



NC 41 AT SR 1945 (JACK DALE RD)
DUPLIN CO.
SEPTEMBER 1, 1997 - MARCH 31, 2001
(3 YRS, 7 MO)
BEFORE PERIOD - TOTAL CRASHES

SR 1945
New Alignment

SR 1945
Old Alignment

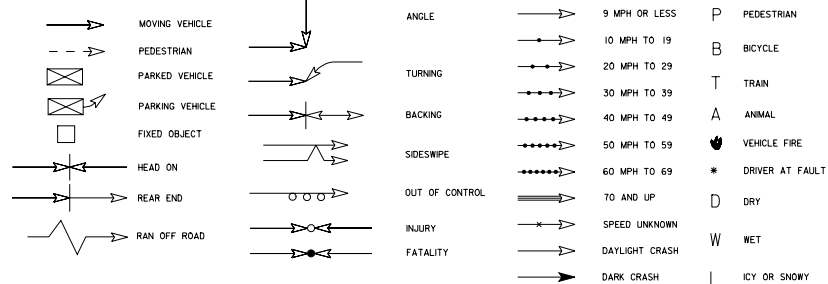


Vehicle Ran Off Road Right First
Then Overcorrected and Crossed Centerline

Vehicle Overturned

Vehicle Ran Off Road Right First
Then Overcorrected and Crossed Centerline

LEGEND



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

HIGHWAY SAFETY
IMPROVEMENT PROGRAM

SAFETY INFORMATION
MANAGEMENT AND SUPPORT



SAFETY EVALUATION

TRAFFIC SAFETY

INTERSECTION OF NC 41
AT SR 1945 (JACK DALE RD)

COLLISION DIAGRAM

DIVISION: 3 REGION: CAPE FEAR

STUDY PERIOD: 09/01/97 - 03/31/01

ANALYSIS PREPARED BY: CLS

DIAGRAM PREPARED BY: CLS

DIAGRAM REVIEWED BY:

SCALE: NOT TO SCALE

DATE: 12/14/2005

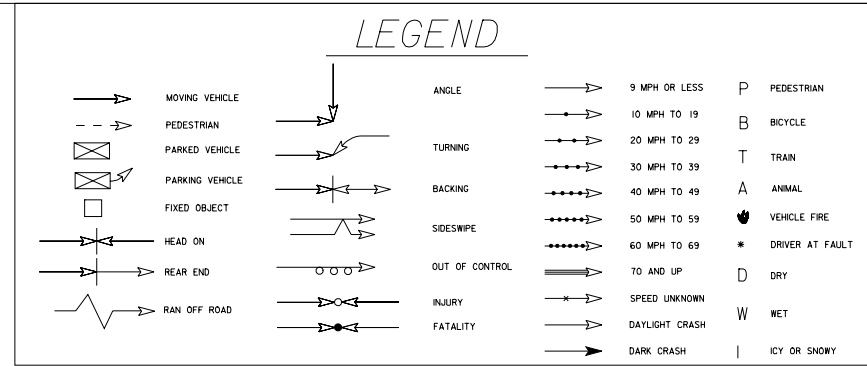
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N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH



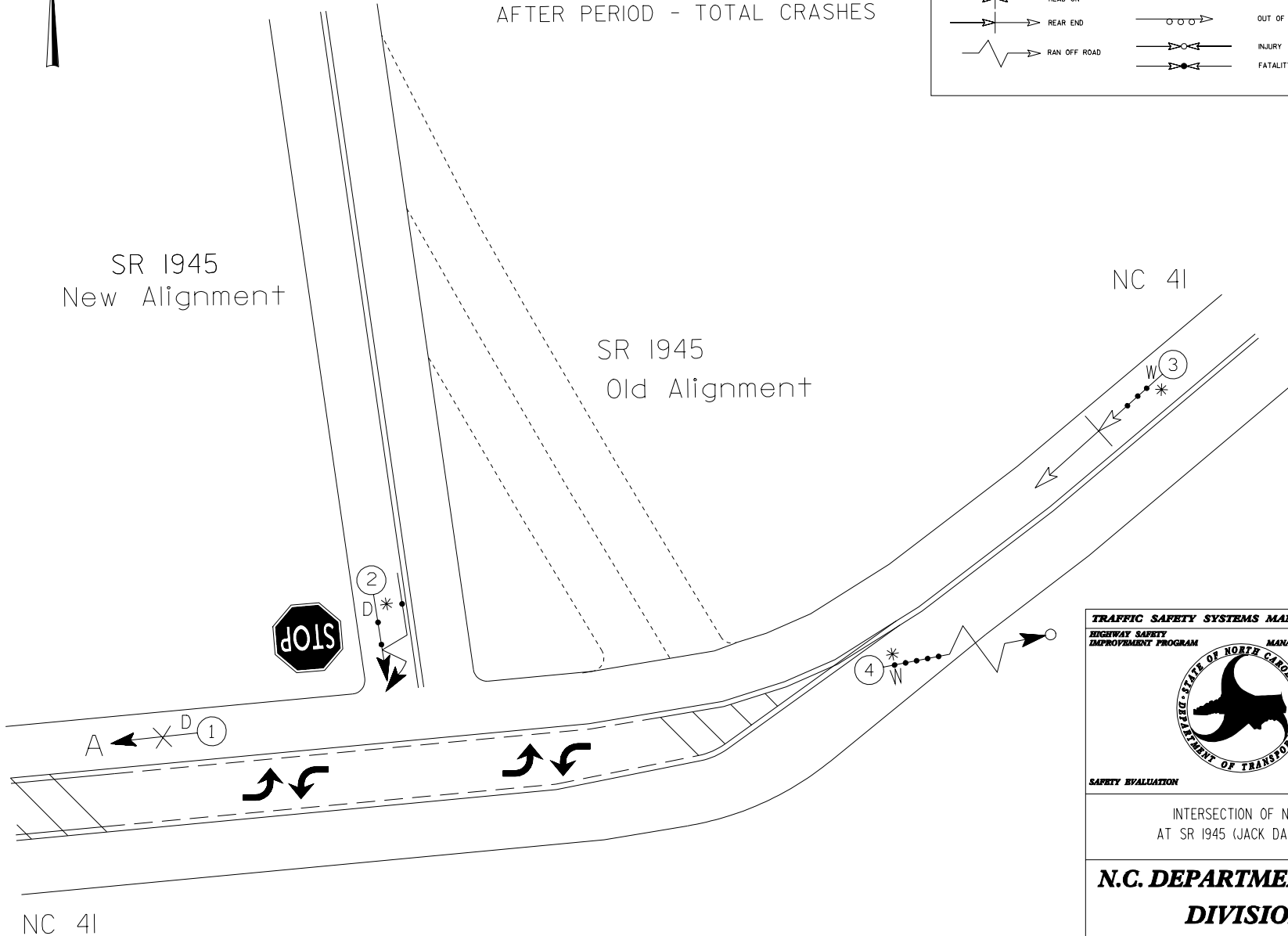
NC 41 AT SR 1945 (JACK DALE RD)
DUPLIN CO.
DECEMBER 1, 2001 - JUNE 30, 2005
(3 YRS, 7 MO)
AFTER PERIOD - TOTAL CRASHES



SR 1945
New Alignment

SR 1945
Old Alignment

NC 41



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT		COLLISION DIAGRAM	
HIGHWAY SAFETY IMPROVEMENT PROGRAM		SAFETY INFORMATION MANAGEMENT AND SUPPORT	
		DIVISION: 3	REGION: CAPE FEAR
		STUDY PERIOD: 12/1/01 - 06/30/05	
		ANALYSIS PREPARED BY: CLS	
		DIAGRAM PREPARED BY: CLS	
SAFETY EVALUATION		TRAFFIC SAFETY	
INTERSECTION OF NC 41 AT SR 1945 (JACK DALE RD)		SCALE: NOT TO SCALE	
		DATE: 12/14/2005	
		LOG NUMBER: 200502093	
		PAGE: 1 OF 1	
N.C. DEPARTMENT of TRANSPORTATION DIVISION of HIGHWAYS TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH			